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Nihei et al.

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(54) **IMAGE FORMING APPARATUS WITH MULTIPLE LIGHT SOURCES TIMING CONTROL**

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B41J 2/47 (2006.01)
G03G 15/043 (2006.01)
G03G 21/14 (2006.01)

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CPC ***G03G 15/043*** (2013.01); *G03G 21/14* (2013.01)

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CPC G03G 15/043; G03G 15/1605; G03G 15/5054; G03G 15/00012; G03G 15/0103
USPC 347/116, 229, 234, 235, 248–250
See application file for complete search history.

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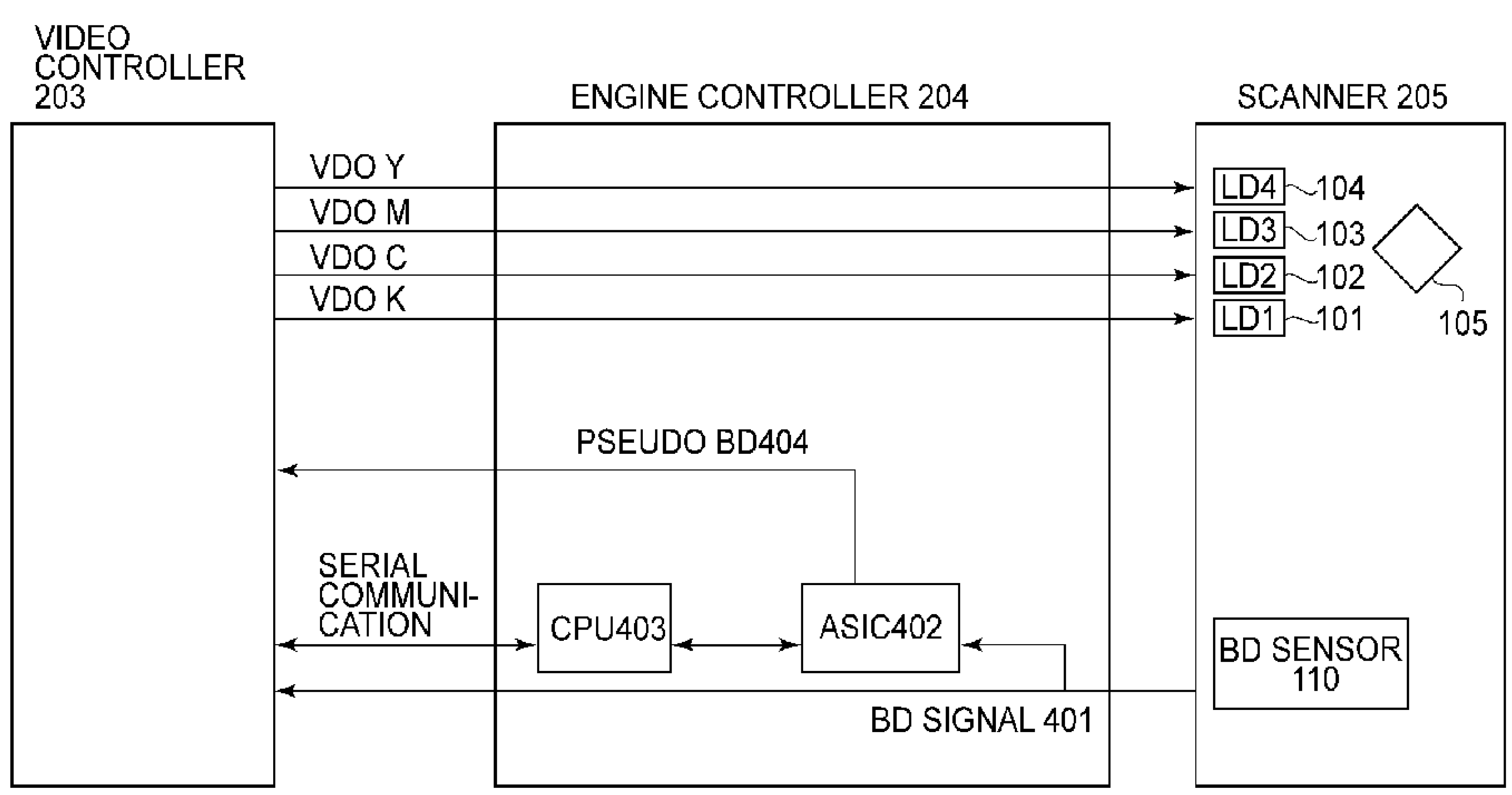
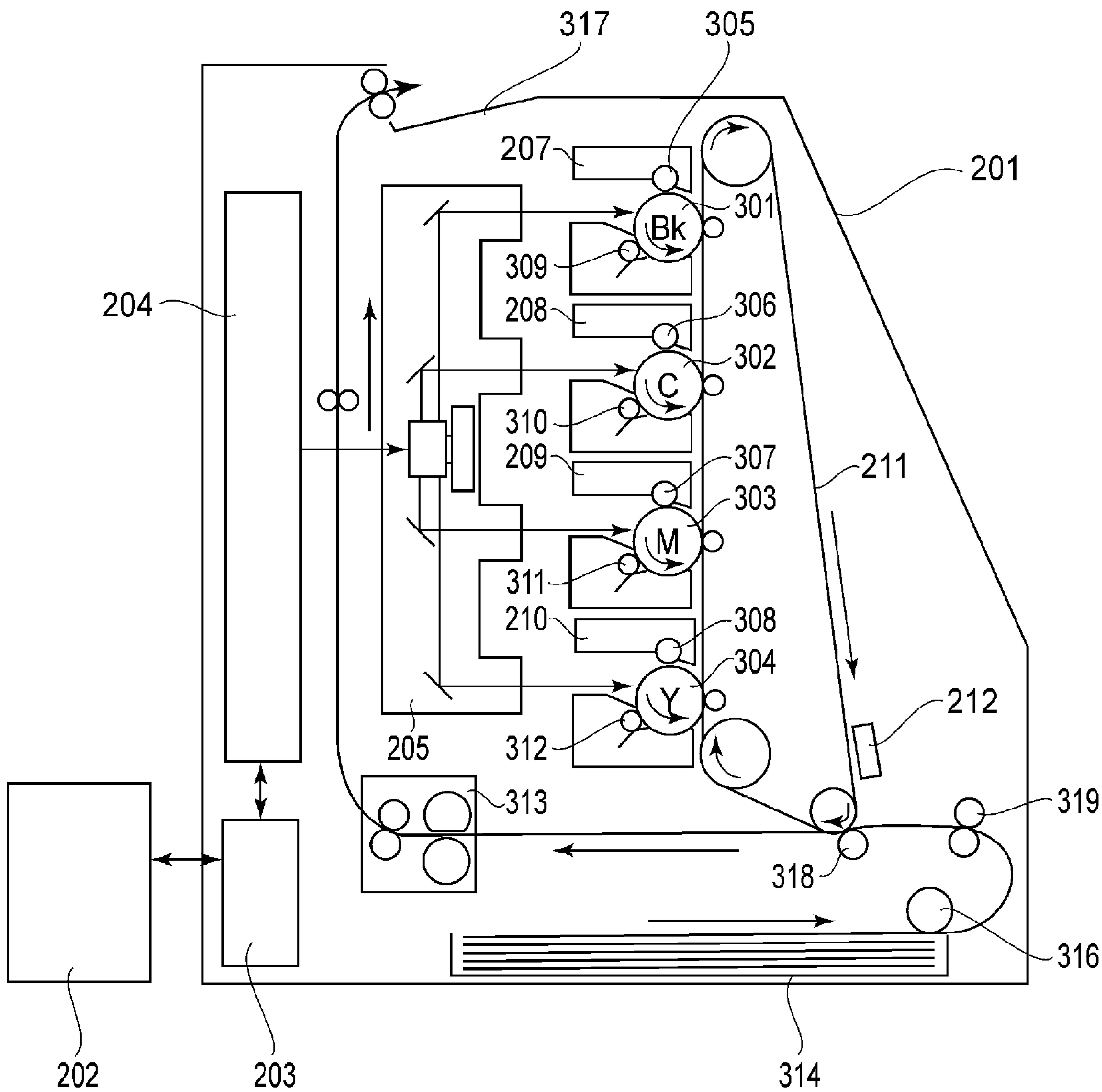
(57) **ABSTRACT**

An image forming apparatus includes first and second photosensitive members; first and second light sources; a rotatable polygonal mirror; a first signal output portion; and a second signal output portion. The first light source emits the light at timing on the basis of the first signal, and the second light source emits the light at timing on the basis of the second signal so that latent images are formed on the first and second photosensitive members, respectively, and then are developed with developers to form developer images on the first and second photosensitive members, respectively, and then an image is formed by superposing the developer images. Before output of a second signal from the second signal output portion is started, the first light source emits the light on the basis of a first signal to start formation of the latent image on the first photosensitive member.

11 Claims, 12 Drawing Sheets

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305
207
201
301
Bk
309
204
208
306
C
302
310
209
307
211
303
M
311
210
308
304
Y
212
205
312
313
319
318
316
202
203
314

FIG.1

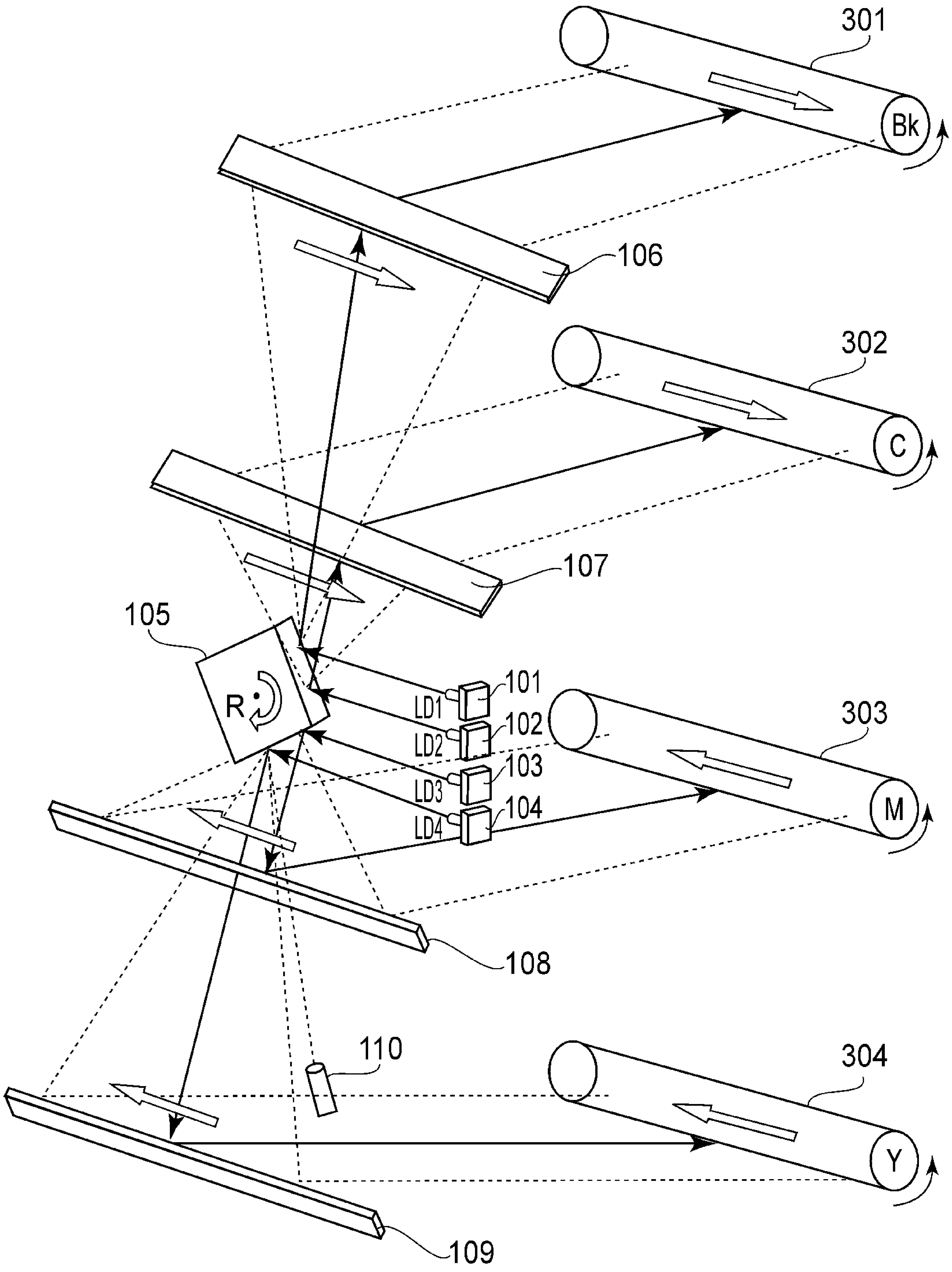

301
Bk
106
302
C
107
105
R
101
LD1
102
LD2
103
LD3
104
LD4
303
M
108
110
304
Y
109

FIG.2

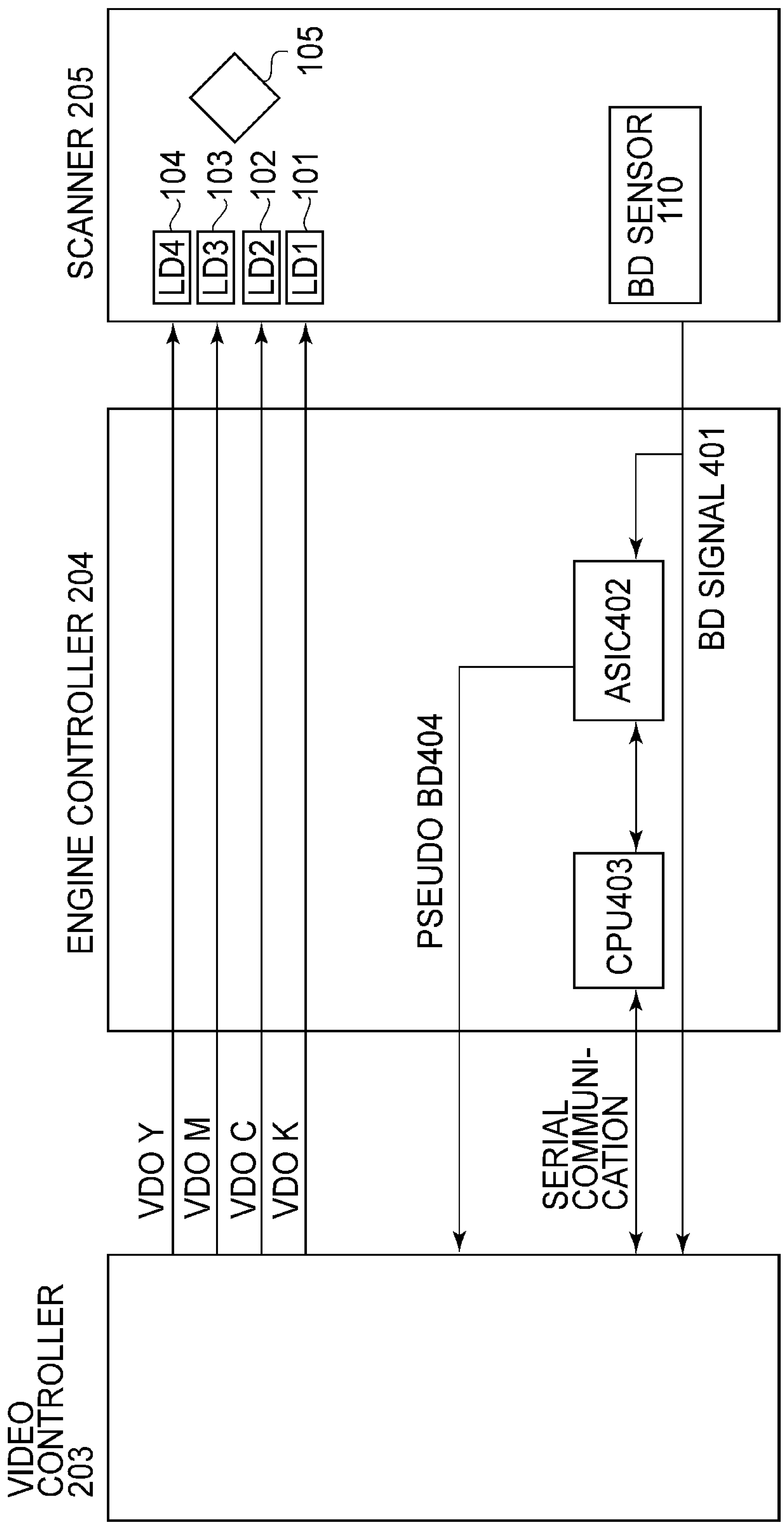
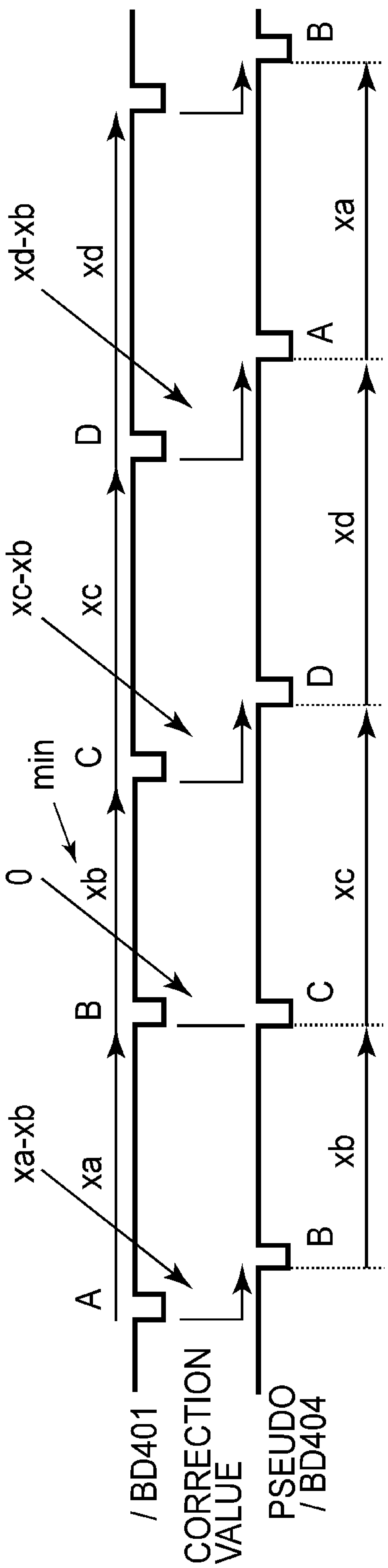
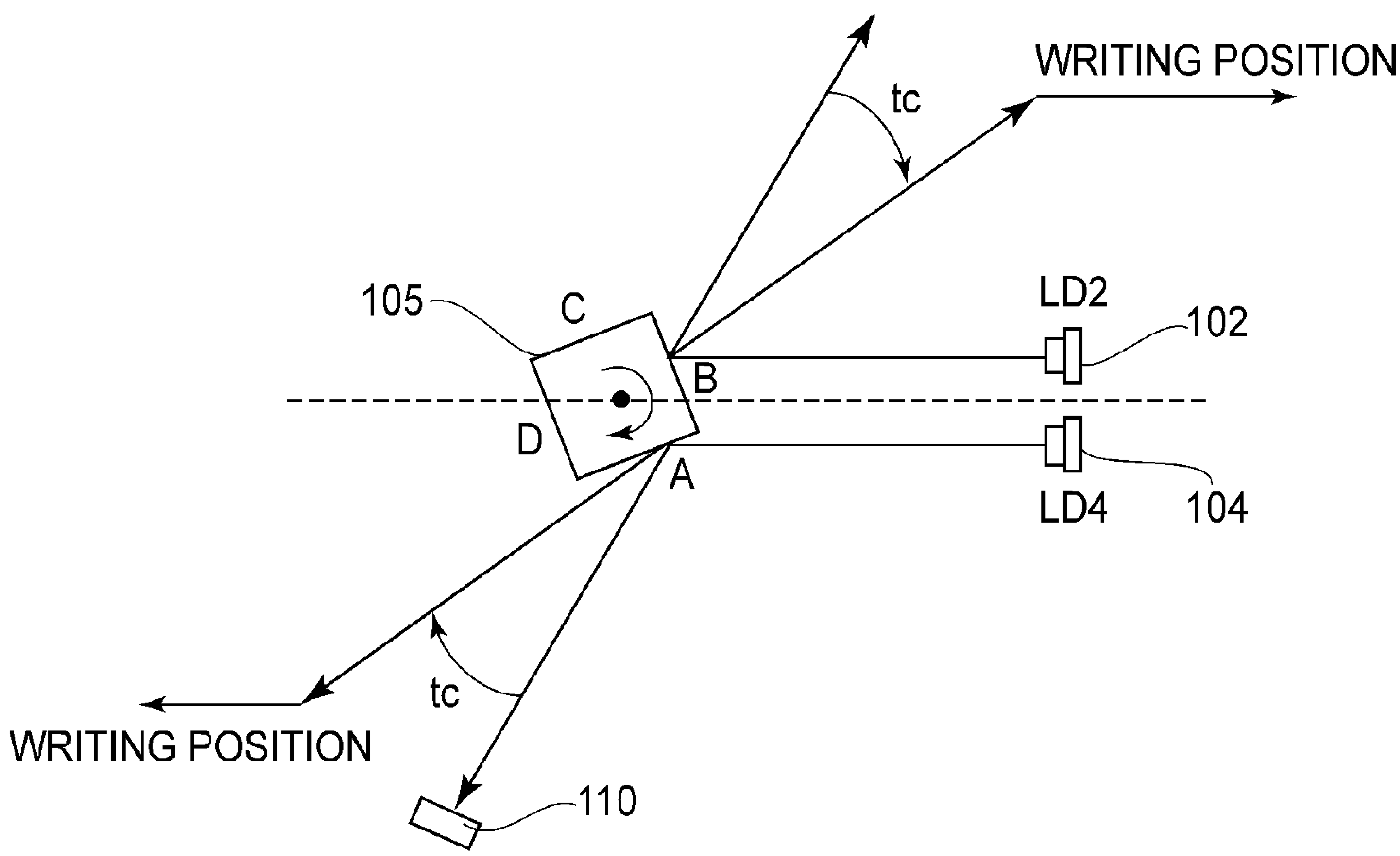

SCANNER 205
LD4
LD3
LD2
LD1
104
103
102
101
105
BD SENSOR 110
ENGINE CONTROLLER 204
BD SIGNAL 401
ASIC402
CPU403
PSEUDO BD404
VDO Y
VDO M
VDO C
VDO K
SERIAL COMMUNI-CATION
VIDEO CONTROLLER 203

FIG.3



/ BD401
CORRECTION VALUE
PSEUDO / BD404
A
B
C
D
xa
xb
xc
xd
xa-xb
0
min
xc-xb
xd-xb

FIG.4



WRITING POSITION
tc
105
C
LD2
102
B
D
A
LD4
104
tc
WRITING POSITION
110

FIG.5

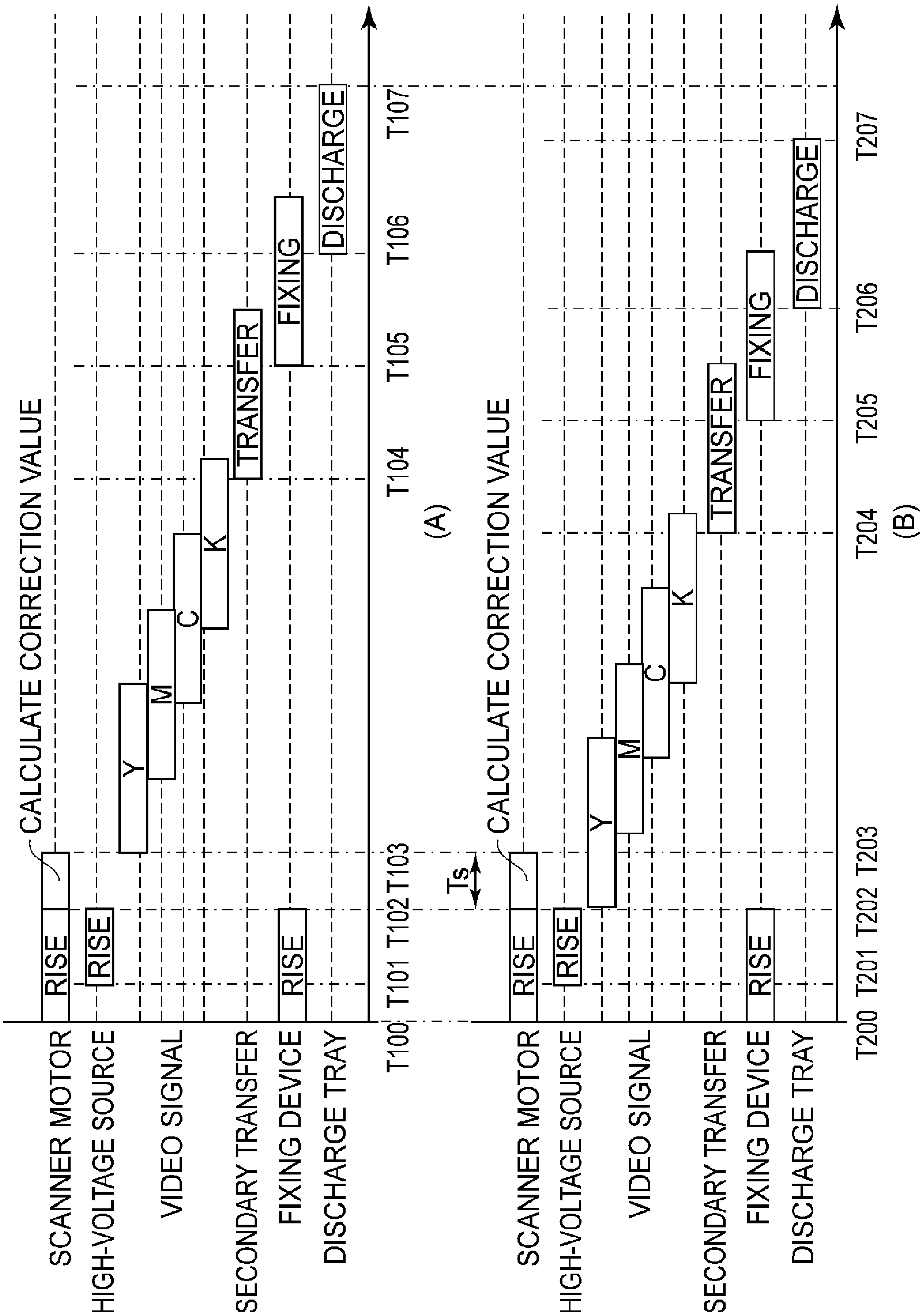

SCANNER MOTOR
HIGH-VOLTAGE SOURCE
VIDEO SIGNAL
SECONDARY TRANSFER
FIXING DEVICE
DISCHARGE TRAY
RISE
RISE
RISE
CALCULATE CORRECTION VALUE
Y
M
C
K
TRANSFER
FIXING
DISCHARGE
T100 T101 T102 T103 T104 T105 T106 T107
Ts
(A)
SCANNER MOTOR
HIGH-VOLTAGE SOURCE
VIDEO SIGNAL
SECONDARY TRANSFER
FIXING DEVICE
DISCHARGE TRAY
RISE
RISE
RISE
CALCULATE CORRECTION VALUE
Y
M
C
K
TRANSFER
FIXING
DISCHARGE
T200 T201 T202 T203 T204 T205 T206 T207
(B)

FIG.6

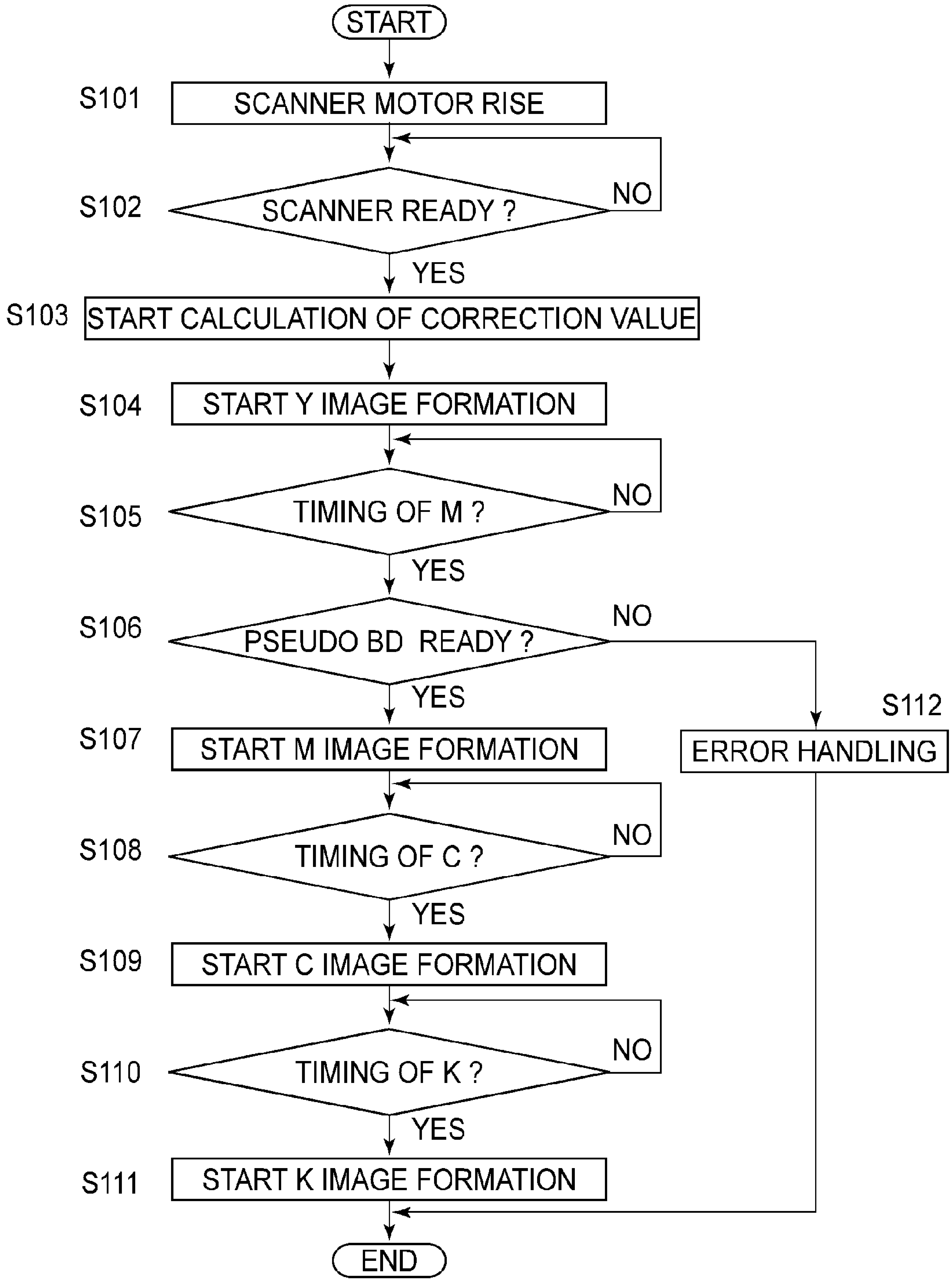

START
S101
SCANNER MOTOR RISE
S102
SCANNER READY ?
NO
YES
S103
START CALCULATION OF CORRECTION VALUE
S104
START Y IMAGE FORMATION
S105
TIMING OF M ?
NO
YES
S106
PSEUDO BD READY ?
NO
YES
S107
START M IMAGE FORMATION
S112
ERROR HANDLING
S108
TIMING OF C ?
NO
YES
S109
START C IMAGE FORMATION
S110
TIMING OF K ?
NO
YES
S111
START K IMAGE FORMATION
END

FIG.7

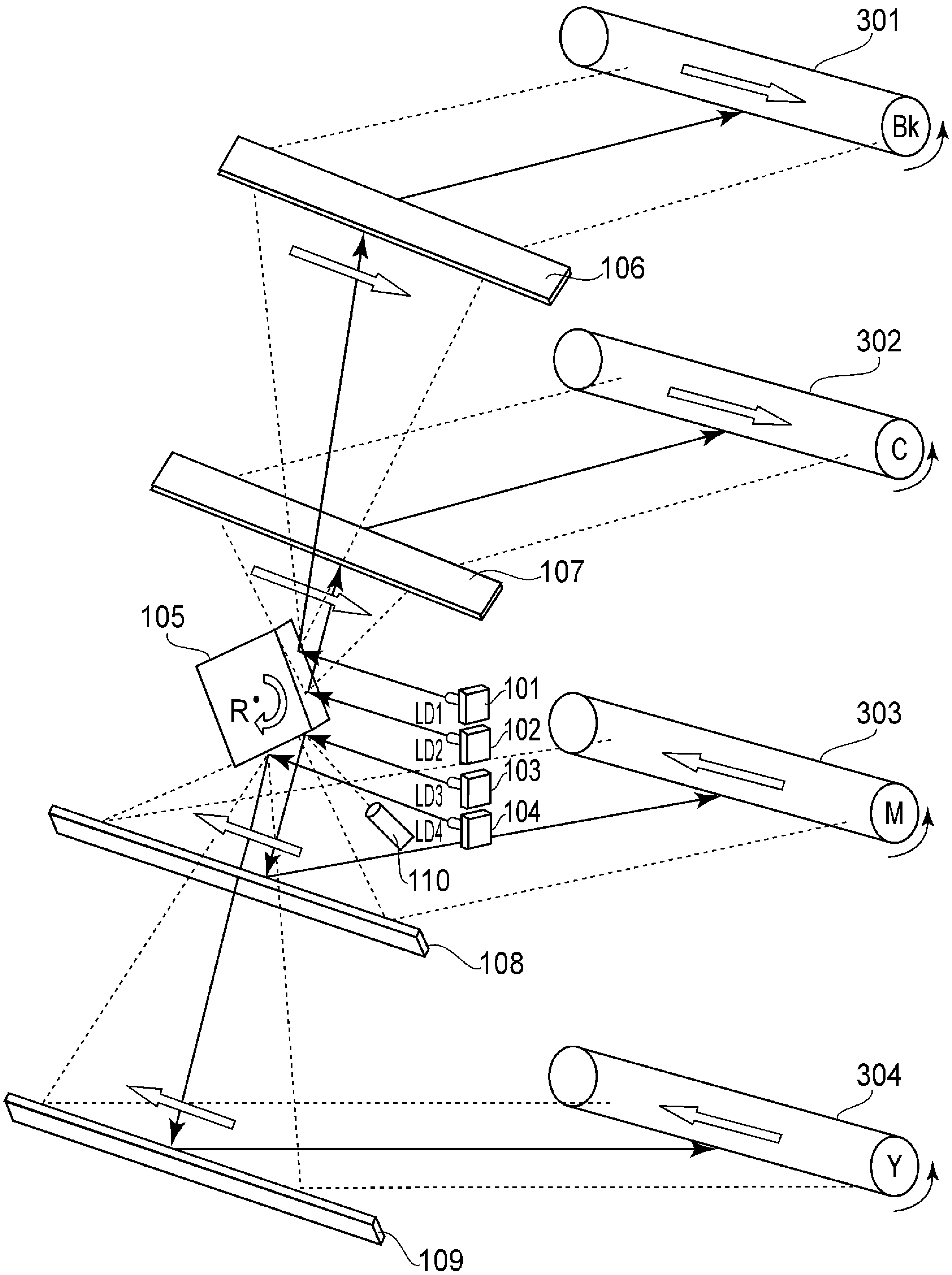

301
Bk
106
302
C
107
105
R
101
102
103
104
LD1
LD2
LD3
LD4
303
M
110
108
304
Y
109

FIG.8

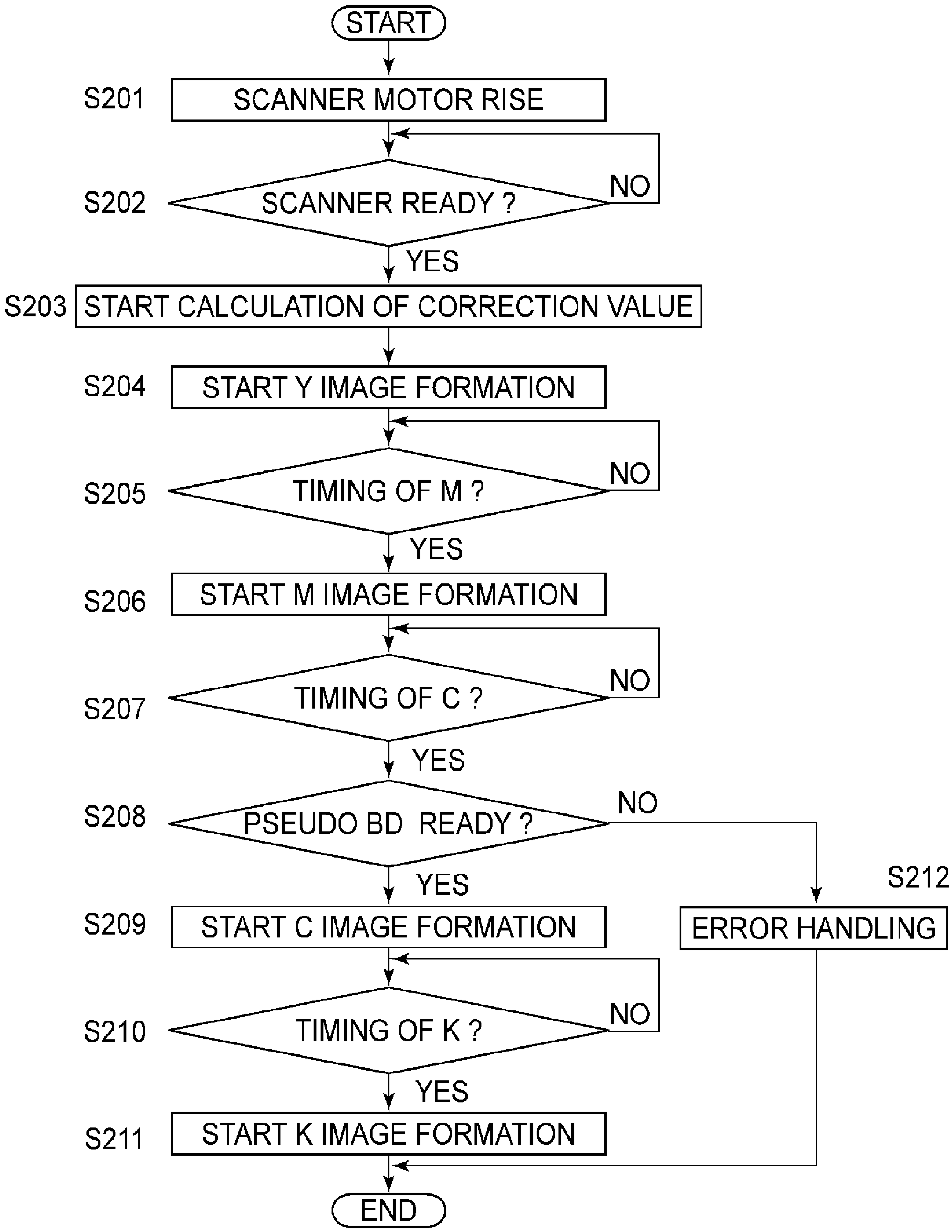

START
S201
SCANNER MOTOR RISE
S202
SCANNER READY ?
NO
YES
S203
START CALCULATION OF CORRECTION VALUE
S204
START Y IMAGE FORMATION
S205
TIMING OF M ?
NO
YES
S206
START M IMAGE FORMATION
S207
TIMING OF C ?
NO
YES
S208
PSEUDO BD READY ?
NO
YES
S212
ERROR HANDLING
S209
START C IMAGE FORMATION
S210
TIMING OF K ?
NO
YES
S211
START K IMAGE FORMATION
END

FIG.9

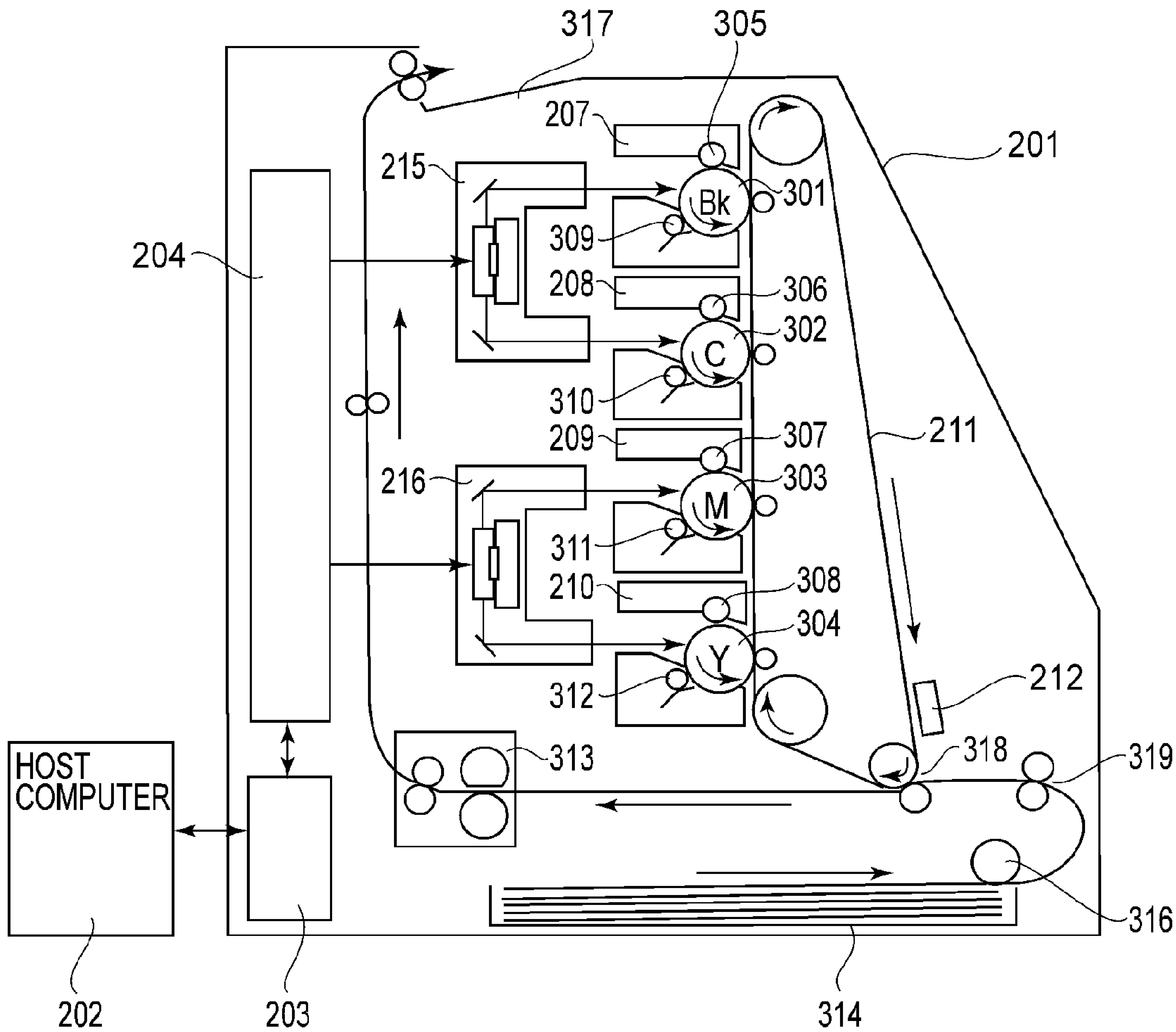

317
305
207
201
215
Bk
301
204
309
208
306
C
302
310
209
307
211
216
M
303
311
210
308
Y
304
212
312
318
HOST COMPUTER
313
319
316
202
203
314

FIG.10

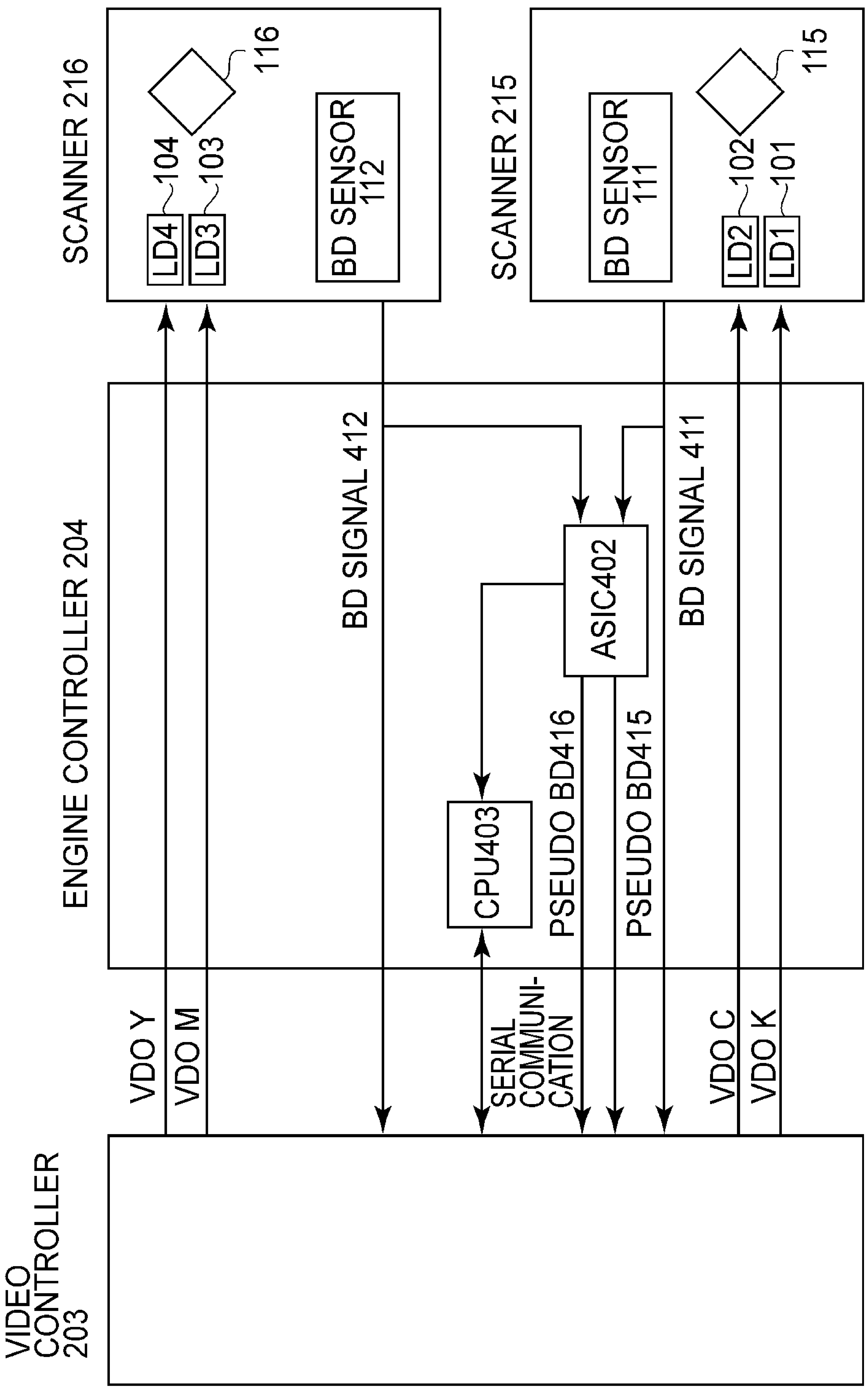

SCANNER 216
LD4
104
LD3
103
116
BD SENSOR
112
SCANNER 215
BD SENSOR
111
LD2
102
LD1
101
115
ENGINE CONTROLLER 204
BD SIGNAL 412
BD SIGNAL 411
ASIC402
CPU403
PSEUDO BD416
PSEUDO BD415
VDO Y
VDO M
SERIAL
COMMUNI-
CATION
VDO C
VDO K
VIDEO
CONTROLLER
203

FIG. 11

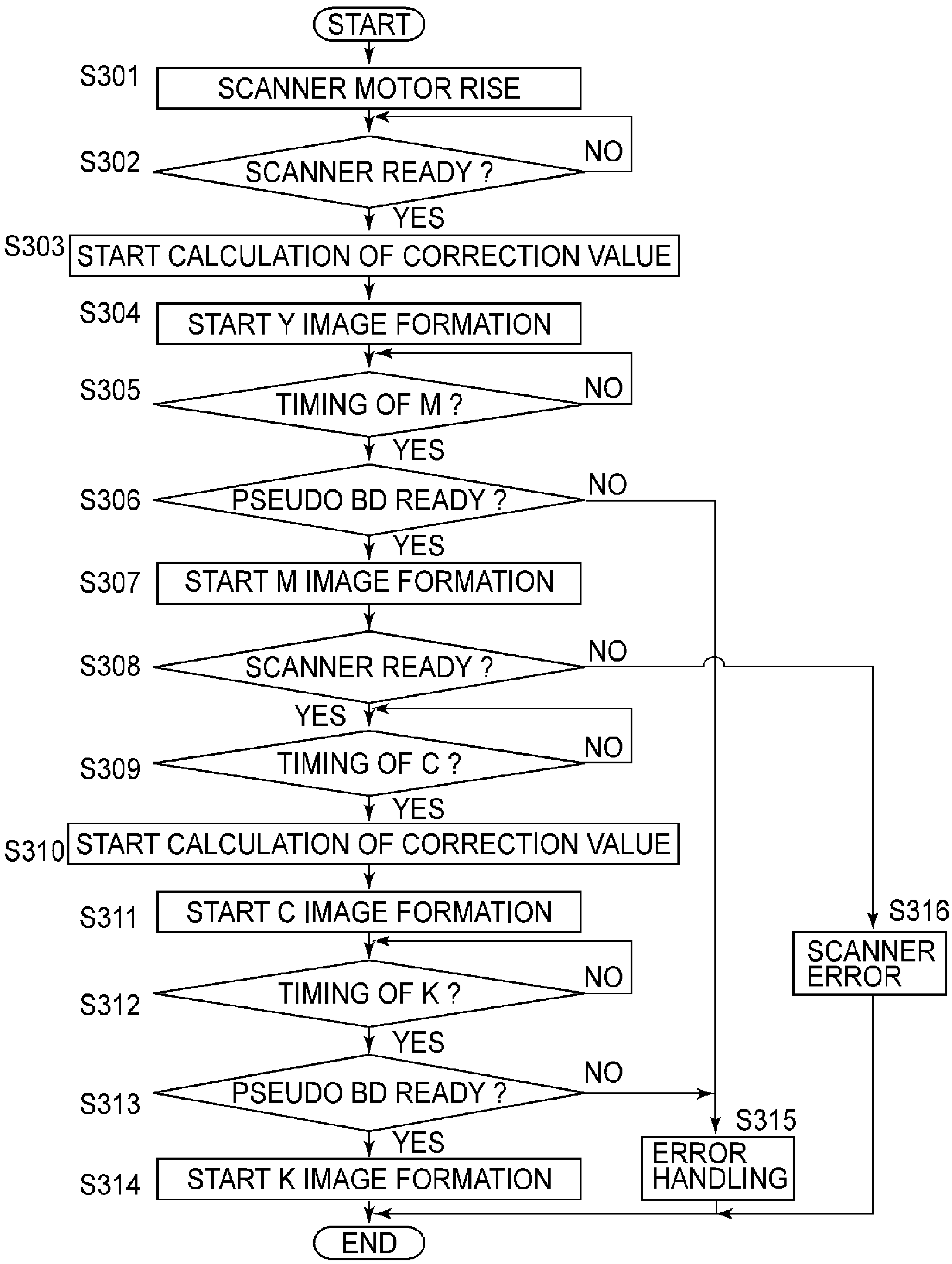

START
S301
SCANNER MOTOR RISE
S302
SCANNER READY ?
NO
YES
S303
START CALCULATION OF CORRECTION VALUE
S304
START Y IMAGE FORMATION
S305
TIMING OF M ?
NO
YES
S306
PSEUDO BD READY ?
NO
YES
S307
START M IMAGE FORMATION
S308
SCANNER READY ?
NO
YES
S309
TIMING OF C ?
NO
YES
S310
START CALCULATION OF CORRECTION VALUE
S311
START C IMAGE FORMATION
S312
TIMING OF K ?
NO
YES
S313
PSEUDO BD READY ?
NO
YES
S314
START K IMAGE FORMATION
S315
ERROR HANDLING
S316
SCANNER ERROR
END

FIG.12

IMAGE FORMING APPARATUS WITH MULTIPLE LIGHT SOURCES TIMING CONTROL

FIELD OF THE INVENTION AND RELATED ART

The present invention relates to an image forming apparatus, such as a copying machine or a printer, having a function of forming an image on a recording material such as a sheet.

In a conventional image forming apparatus of an electrophotographic type, a laser beam modulated by an image signal is reflected by a rotational polygonal mirror provided in a scanner to scan a surface of a photosensitive member, thus effecting image formation. As the photosensitive member, a drum shaped photosensitive member is frequently used and is called a photosensitive drum. In the case where this type is applied to a color laser printer, an image of four colors of yellow (Y), magenta (M), cyan (C) and black (BK) are superposed to form a color image on a sheet.

Here, in Japanese Laid-Open Patent Application (JP-A) 2003-200609, a constitution for synchronizing image writing timing in the case where the number of BD (beam detect) sensors is decreased in an image forming apparatus in which a plurality of photosensitive members are simultaneously scanned with laser beams by using a single polygonal mirror is disclosed. In this constitution, with respect to the laser beam for which a corresponding BD sensor is not provided, the image writing timing is synchronized by using a pseudo BD side as described below. That is, by calculating an amount of delay of a horizontal synchronizing signal with respect to each side of the polygonal mirror in anticipation of a side division error in each mirror side of the polygonal mirror, the pseudo BD signal is generated from a BD signal, and then the image writing timing is synchronized by using the pseudo BD signal.

However, the image forming apparatus described in JP-A 2003-200609 involves the following problem.

In JP-A 2003-200609, the pseudo BD signal was generated from the BD signal by calculating the amount of delay of the horizontal synchronizing signal with respect to each side of the polygonal mirror in anticipation of the side division error of the polygonal mirror. In this case, image formation was started after completion of the calculation of this amount of delay.

For this reason, there is a fear that a first print out time becomes long.

SUMMARY OF THE INVENTION

A principal object of the present invention is to provide an image forming apparatus capable of reducing a first print out time in a constitution in which light is emitted from a light source at timing on the basis of a pseudo BD signal generated on the basis of a BD signal to form a latent image.

According to an aspect of the present invention, there is provided an image forming apparatus comprising: first and second photosensitive members; first and second light sources each for emitting light; a rotatable polygonal mirror for deflecting the light, emitted from the first light source, toward the first photosensitive member and for deflecting the light, emitted from the second light source, toward the second photosensitive member; first signal output means for outputting a first signal by detecting, in a predetermined position, the light emitted from the first light source and deflected by the rotatable polygonal mirror; and second signal output means for outputting a second signal different from the first signal on the basis of the first signal, wherein the first light source emits the light at timing on the basis of the first signal and the second light source emits the light at timing on the basis of the second signal so that latent images are formed on the first and second photosensitive members, respectively, and then are developed with developers to form developer images on the first and second photosensitive members, respectively, and then an image is formed by superposing the developer images, and wherein before output of the second signal from the second signal output means is started, the first light source emits the light on the basis of the first signal to start formation of the latent image on the first photosensitive member.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view showing a general structure of an image forming apparatus in Embodiment 1.

FIG. **2** is a schematic perspective view for illustrating a scanner unit in Embodiment 1.

FIG. **3** is a block diagram for illustrating a generating method of a pseudo BD signal in Embodiment 1.

FIG. **4** is a timing chart for illustrating the generating method of the pseudo BD signal in Embodiment 1.

FIG. **5** is a schematic view showing a relation between a polygonal mirror, laser diodes and a BD sensor in Embodiment 1.

Parts (A) and (B) of FIG. **6** are timing charts each for illustrating a feature of Embodiment 1.

FIG. **7** is a flowchart showing an operation executed by an engine controller in Embodiment 1.

FIG. **8** is a schematic perspective view for illustrating a scanner unit in Embodiment 2.

FIG. **9** is a flowchart showing an operation executed by an engine controller in Embodiment 2.

FIG. **10** is a sectional view showing a general structure of an image forming apparatus in Embodiment 3.

FIG. **11** is a block diagram for illustrating a generating method of a pseudo BD signal in Embodiment 3.

FIG. **12** is a flowchart showing an operation executed by an engine controller in Embodiment 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, embodiments for carrying out the present invention will be specifically described. However, dimensions, materials, shapes and relative arrangements of constituent elements described in the following embodiments should be appropriately modified depending on constitutions and various conditions of a device (apparatus) to which the present invention is applied. That is, the scope of the present invention is not limited to the following embodiments. The present invention relates to an image forming apparatus using an electrophotographic process, and particularly relates to a color image forming apparatus for forming different color images by using a plurality of laser beams.

Embodiment 1

Embodiment 1 of the present invention will be described. FIG. **1** is a sectional view showing a schematic structure of a color laser (beam) printer **201** as an image forming apparatus in this embodiment.

The printer **201** is connected with a host computer **202**. The printer **201** includes four color image forming portions for forming a color image obtained by superposing images of four colors of yellow (Y), magenta (M), cyan (C) and black (BK). The image forming portions include toner cartridges **207** to **210** including photosensitive drums **301** to **304** as an image bearing member, and a scanner unit **205** including laser diodes, as a light source for image exposure, for generating light (laser beams). The scanner unit **205** will be described specifically later.

When the printer **201** receives image data from the host computer **202**, a video controller **203** in the printer **201** develops the image data into desired video signal forming data (e.g., bit-mapped data) to generate video signals for image formation. The video controller **203** and the engine controller **204** carry out serial communication, thus effecting transmission and reception of information. The video signals are sent to the engine controller **204**, and then the engine controller **204** drives laser diodes (not shown) in the scanner unit **205** on the basis of the video signals. As a result, electrostatic latent images (latent images) are formed on the photosensitive drums **301** to **304** in the toner cartridges **207** to **210**, respectively.

The photosensitive drums **301** to **304** are used for forming the electrostatic latent images for black, cyan, magenta and yellow, respectively.

In the toner cartridges **207** to **210**, the electrostatic latent images formed on the photosensitive drums **301** to **304** are visualized (developed) by using toners (developers), so that color toner images are formed on the photosensitive drums **301** to **304**. Of the respective color toner images formed on the photosensitive drums (image bearing members), the toner image of yellow (first color) is first transferred onto an intermediary transfer belt (belt) **211**, and then the toner images of magenta, cyan and black are successively transferred superposedly in the stated order on the belt (primary transfer). As a result, a color image is formed on the intermediary transfer belt **211**. Here, in the toner cartridges **207** to **210**, developing devices **309** to **312** and cleaning devices **305** to **308** are provided. Here, the photosensitive drums **304** and **302** correspond to first and second image bearing members, respectively. Further, with respect to a movement direction of a surface of the intermediary transfer belt **211**, a contact portion between the photosensitive drum **304** and the intermediary transfer belt **211** is disposed upstream of a contact portion between the photosensitive drum **302** and the intermediary transfer belt **211**.

Further, a recording material in a cassette **314** is fed to a registration roller **319** by a feeding roller **316**, and then is conveyed, at driving timing of the registration roller **319**, in synchronism with the color image on the intermediary transfer belt **211**. Then, the color image is transferred from the intermediary transfer belt **211** onto the recording material by a transfer roller **318** (secondary transfer). The recording material on which the image is transferred is conveyed into a fixing device **313**, and then the image is fixed on the recording material under heat and pressure by the fixing device **313**. Thereafter, the recording material on which the image is fixed is discharged onto a discharge tray **317** at an upper portion of the printer **201**.

Further, the printer **201** is provided with a registration detecting sensor **212** for monitoring a registration position of the image on the intermediary transfer belt **211**. This sensor **212** reads a position of each of the color images, formed on the intermediary transfer belt **211**, at desired timing other than during image formation, and then feeds back the read data to the video controller **203** or the engine controller **204**. As a result, the registration position of each of the color toner images is adjusted, so that it is possible to prevent color misregistration.

FIG. **2** is a schematic perspective view for specifically illustrating the scanner unit **205** shown in FIG. **1**. In FIG. **2**, reference numerals **101**, **102**, **103** and **104** represent laser diodes, and on the basis of the video signal generated by the video controller **203**, the surfaces of the photosensitive drums **301**, **302**, **303** and **304** are scanned with laser beams (light beams) emitted from the laser diodes **101**, **102**, **103** and **104**, respectively. In the following description, for convenience, the laser diodes **101**, **102**, **103** and **104** are referred to as laser diodes LD**1**, LD**2**, LD**3** and LD**4**, respectively. Here, the laser diodes LD**4** and LD**2** correspond to first and second light sources, respectively.

A polygonal mirror **105** as a rotational polygonal mirror is rotated in an arrow R direction in FIG. **2** by an unshown motor and is used for subjecting the light beams from the laser diodes LD**1**, LD**2**, LD**3** and LD**4** to deflection scanning. The motor for driving the polygonal mirror **105** is controlled so as to be rotated at a certain speed by an acceleration signal and a reduced speed signal of an unshown control signal from the engine controller **204**.

A BD sensor **110** is an optical sensor provided in a predetermined position where the light (beam) which is emitted from the laser diode LD**4** and which is then reflected by the polygonal mirror **105** in a predetermined direction enters. The BD sensor **110** receives (detects) the light from the laser diode LD**4** (first light source) and outputs a horizontal synchronizing signal (BD (beam detect) signal) on the basis of the light. The horizontal synchronizing signal (first horizontal synchronizing signal) outputted from the BD sensor is a signal as a reference (basis) of timing of light emission of the laser diode LD**4** for forming the electrostatic latent image on the photosensitive drum **304** (first image bearing member). Specifically, a writing position (emission start position of the laser diode for each reflection side) of a scanning line corresponding to an associated reflection side when the scanning line is formed by reflecting the light beam from the laser diode at the reflection side of the rotating polygonal mirror **105** and then by moving a beam spot on the photosensitive member in a main scan image is determined on the basis of the horizontal synchronizing signal. The BD sensor **110** corresponds to a first signal output means for outputting the first horizontal synchronizing signal.

The light emitted from the laser diode LD**4** is used for scanning by the rotation of the polygonal mirror **105** while being reflected by the polygonal mirror **105**, and then is further reflected by a folding mirror **109**, so that the photosensitive drum **304** is illuminated with the light. As a result, the electrostatic latent image is formed on the photosensitive drum **304**.

Incidentally, in actuality, the light passes through unshown various lens groups in order to be focused on the photosensitive drum or in order to be converted from diffused light into parallel light.

The timing when the BD sensor **110** outputs the signal is timing when an incident angle of the light emitted from the laser diode LD**4** is a predetermined angle irrespective of whether the light is incident on which reflection side of the polygonal mirror **105**. Accordingly, usually, the video controller **203** sends the video signals to the engine controller **204** after a predetermined time from detection of an output signal of the BD sensor **110** is counted. As a result, a main scanning writing position of the image by the light on the photosensitive drum can be determined in an arbitrary position irrespective of whether the light emitted from the laser diode LD**4** is incident on which reflection side of the polygonal mirror **105**, so that writing positions of the respective scanning lines can be always made coincide with each other.

On the other hand, also with respect to the laser diodes LD**1**, LD**2** and LD**3**, similarly as in the laser diode **4**, the electrostatic latent images are formed on the photosensitive drums **301**, **302** and **303**, respectively.

Here, the BD sensor **110** is provided only in the position where the light emitted from the laser diode LD**4** enters, so that there is no BD sensor on scanning passages of the laser diodes LD**1**, LD**2** and LD**3**. The light from the laser diode LD**3** and the light from the laser diode LD**4** are incident on the same side of the polygonal mirror **105** at the same timing. For this reason, as a horizontal synchronizing signal as a reference of (light) emission timing of the laser diode LD**3** for forming the electrostatic latent image on the photosensitive drum **303**, the above-described first horizontal synchronizing signal (first signal) generated by the light from the laser diode LD**4**, i.e., the BD signal outputted from the BD sensor **110** can be used. On the other hand, the light from the laser diode LD**1** and the light from the laser diode LD**2** are incident on a side different from the side, of the polygonal mirror **105**, where the light from the laser diode LD**4** is incident on the polygonal mirror **105** at the same timing, so that associated photosensitive drums are illuminated therewith, respectively. That is, at the timing when the photosensitive drums **301** and **302** are illuminated with the light from the laser diode LD**1** and the light from the laser diode LD**2** and when the photosensitive drums **303** and **304** are illuminated with the light from the laser diode LD**3** and the light from the laser diode LD**4**, the side of the polygonal mirror **105** on which the light from the laser diode LD**1** and the light from the laser diode LD**2** are incident and the side of the polygonal mirror **105** on which the light from the laser diode LD**3** and the light from the laser diode LD**4** are incident are different from each other.

Here, the polygonal mirror **105** causes an error (side division error) due to molding accuracy of the reflection sides. For this reason, at the timing when the BD sensor **110** outputs the signal, there is a variation, for each of the reflection sides, in angle of the reflection side of the polygonal mirror **105** on which the light from the laser diode LD**1** and the light from the laser diode LD**2** are incident. For this reason, even when the side of the polygonal mirror **105** on which the light from the laser diode LD**1** and the light from the laser diode LD**2** are incident is which reflection side, another horizontal synchronizing signal to be outputted at timing when the reflection side provides a predetermined angle is needed.

For this reason, in this embodiment, a BD signal (second horizontal synchronizing signal or second signal) for the laser diodes LD**1** and LD**2** (second light source) is generated by ASIC **402**. The horizontal synchronizing signal (second horizontal synchronizing signal) generated by the ASIC **402** is a pseudo horizontal synchronizing signal (pseudo BD signal) providing a reference of timing when the laser diodes LD**1** and LD**2** emit the light beams in order to form the electrostatic latent images on the photosensitive drums **301** and **302** (second image bearing member). The pseudo BD signal is generated by correcting the first horizontal synchronizing signal.

In this embodiment, the light beams emitted from the laser diodes LD**1** and LD**2** are incident on the same side of the polygonal mirror **105** at the same timing, and therefore the pseudo BD signal can be made common to the laser diodes LD**1** and LD**2**. In the following, description will be made on assumption that the ASIC **402** generates the pseudo BD signal for the laser diode LD**2**. Here, the laser diode LD**2** corresponds to the second light source different in electrostatic latent image formation start timing from the laser diode LD**4** (first light source).

As described above, the color image of yellow (Y) is formed on the photosensitive drum **304** by the laser diode LD**4** provided with the BD sensor **110**. Further, the color images of black (BK), cyan (C) and magenta (M) are formed on the photosensitive drums **301**, **302** and **303** by the laser diodes LD**1**, LD**2** and LD**3**, respectively, provided with no BD sensor **110**. As a result, the image formation is effected. A series of image forming process operations is as described above.

Next, a generating method of the pseudo BD signal will be described with reference to a block diagram of FIG. **3**.

Inside the engine controller **204**, the ASIC **402** and CPU **403** are provided and are connected by an address data bus. The ASIC **402** includes a circuit for generating the pseudo BD signal.

First, a BD signal **401** as the horizontal synchronizing signal from the BD sensor **110** is inputted into the ASIC **402**, provided in the engine controller **204**, and the video controller **203**. The ASIC **402** receives the BD signal **401** and calculates a BD period described later, and then sends a value of the calculated BD period to the CPU **403**. The CPU **403** corrects the BD signal **401** from the value of the BD period to calculate (derive) a correction value for generating the pseudo BD signal, and then inputs the correction value into the ASIC **402** through the address data bus. Then, the ASIC **402** generates (outputs) a pseudo BD signal **404** on the basis of the correction value and the BD signal **401** from the BD sensor **110**. The outputted pseudo BD signal is inputted into the video controller **203**. Thus, the ASIC **402** and the CPU **403** constitute a second signal output means for generating and outputting, on the basis of the BD signal **401**, the BD signal (second horizontal synchronizing signal) for the laser diodes LD**1** and LD**2**. This second output means executes a step of deriving the correction value by calculating the correction value on the basis of the BD period, and when the derivation of the correction value is completed, the second signal output means outputs the pseudo BD signal **404**. Here, this correction value is a correction value, with respect to the laser diode LD**2**, for correcting a difference in electrostatic latent image formation start timing on the basis of the BD signal between the laser diodes LD**2** and LD**4**. Further, in the following description, this correction value is referred to as a correction value for the pseudo BD signal is some cases for convenience of explanation.

The video controller **203** receives the BD signal **401** outputted from the BD sensor **110** and the pseudo BD signal **404** outputted from the ASIC **402**. At predetermined timing from the input of the BD signal **401**, image data VDOM and VDOY are outputted from the video controller **203** to the laser diodes LD**3** and LD**4** of the scanner unit **205**. The laser diodes LD**3** and LD**4** emit the light on the basis of the image data VDOM and VDOY, so that the electrostatic latent images on the basis of the image data VDOM and VDOY are formed on the photosensitive drums **303** and **304**. Similarly, at predetermined timing from the input of the pseudo BD signal **404**, image data VDOK and VDOC are outputted from the video controller **203** to the laser diodes LD**1** and LD**2** of the scanner unit **205**. The laser diodes LD**1** and LD**2** emit the light on the basis of the image data VDOK and VDOC, so that the electrostatic latent images on the basis of the image data VDOK and VDOC are formed on the photosensitive drums **301** and **302**.

Next, a correction value calculating method for every 4 sides and a pseudo BD side generating method for every 4 sides will be described with reference to a timing chart shown in FIG. **4** and a relation view of the polygonal mirror **105**, the laser diodes LD**2** and LD**4** and the BD sensor **110** shown in FIG. **5**.

With respect to the polygonal mirror **105**, due to the molding accuracy error (side division error), the BD period is different every side.

In this embodiment, with respect to the BD signal for each side of the polygonal mirror **105**, periods (BD periods), measured by the ASIC **402**, from A side to B side, from B side to C side, from C side to D side, and from D side to A side are xa, xb, xc and xd, respectively. Here, it can be said that, e.g., the BD period xa is a time (interval) from detection of the light, which is emitted from the laser diode LD**4** and which is then reflected by the A side, by the BD sensor **110** to detection of the light, which is emitted from the laser diode LD**4** and which is then reflected by the B side, by the BD sensor **110**.

From each of the BD periods for the respective sides, a smallest BD period as these BD periods is subtracted, so that a resultant value is used as the correction value.

The reason therefor is as follows. When the BD signal uses the A side, the pseudo BD signal uses the B side, and when the BD signal uses the side B, the pseudo BD signal uses the C side. Further, when the BD signal uses the C side, the pseudo BD signal uses the D side, and when the BD signal uses the D side, the pseudo BD signal uses the A side. Then, on the basis of correspondence between the BD signal and the pseudo BD signal, the correction value is determined. Further, the correction value depends on the polygonal mirror **105** and is little changed with time, and therefore writing from the BD signal **401** is constant. Further, a reference side is determined by determining that the polygonal mirror side having the smallest BD period provides the correction value of 0.

Therefore, in the case where the smallest (shortest) BD period is xb, the correction values are determined as follows.

The correction value for the B side with respect to the pseudo BD signal associated with the A side with respect to the BD signal is represented by:

$$(\text{Period of BD signal from } A \text{ side to } B \text{ side})-(\text{Shortest BD period})=xa-xb.$$

Accordingly, the correction value is (xa−xb).

Further, the correction value for the C side with respect to the pseudo BD signal associated with the B side with respect to the BD signal is represented by:

$$(\text{Period of BD signal from } B \text{ side to } C \text{ side})-(\text{Shortest BD period})=xb-xb.$$

Accordingly, the correction value is 0.

Further, the correction value for the D side with respect to the pseudo BD signal associated with the C side with respect to the BD signal is represented by:

$$(\text{Period of BD signal from } C \text{ side to } D \text{ side})-(\text{Shortest BD period})=xc-xb.$$

Accordingly, the correction value is (xc−xb).

Further, the correction value for the A side with respect to the pseudo BD signal associated with the D side with respect to the BD signal is represented by:

$$(\text{Period of BD signal from } D \text{ side to } A \text{ side})-(\text{Shortest BD period})=xd-xb.$$

Accordingly, the correction value is (xd−xb).

With respect to the pseudo BD signal or the B side associated with the BD signal for the A side, the correction value is (xa−xb), and therefore the pseudo BD signal having the BD period which is delayed from the BD period of the BD signal by (xa−xb) is generated and outputted.

With respect to the pseudo BD signal or the C side associated with the BD signal for the B side, the correction value is 0, and therefore the BD signal itself is outputted as the pseudo BD signal.

With respect to the pseudo BD signal or the D side associated with the BD signal for the C side, the correction value is (xc−xb), and therefore the pseudo BD signal having the BD period which is delayed from the BD period of the BD signal by (xc−xb) is generated and outputted.

With respect to the pseudo BD signal or the A side associated with the BD signal for the D side, the correction value is (xd−xb), and therefore the pseudo BD signal having the BD period which is delayed from the BD period of the BD signal by (xd−xb) is generated and outputted.

In generation of the pseudo BD signal, when the BD signal is outputted, the side of the polygonal mirror **105** by which the light emitted from the laser diode LD**4** is deflected is determined, so that the correction value is determined from the BD period calculated correspondingly to the determined side. In this case, the BD period is different for every side, and therefore by calculating the BD period, it is possible to specify the side of the polygonal mirror by which the light emitted from the laser diode LD**4** is deflected.

In the case of the BD signal **401**, the pseudo BD signal **404** as shown in FIG. **4** is generated. In this way, the signal (pseudo BD signal), other than the BD signal, to be outputted at timing different from the output timing of the BD signal is generated. Incidentally, the signal other than the BD signal refers to a signal, to be outputted timing different from the output timing of the BD signal before the correction is made, which is at least one of the BD signals sent during one turn (rotation) of the polygonal mirror **105** (i.e., the BD signals outputted four times in total for the four sides in this embodiment). That is, as in the case of the above-described pseudo BD signal, if at least one side provides the correction value of 0 as when the pseudo BD signal is outputted on the basis of the BD signal for one of the A side, the C side and the D side, the signal constitutes the signal other than the BD signal even when the case where the correction value is 0 as in the case where the pseudo BD signal is outputted on the basis of the BD signal for the B side is included.

A series of process operations of the pseudo BD signal generation is as described above.

Here, in the case, the reference side is determined by determining that the polygonal mirror side having the smallest (shortest) BD period provides the correction value of 0, but the present invention is not limited thereto. However, in this embodiment, in order to further enhance accuracy of the timing of the pseudo BD signal, the polygonal mirror side having the smallest BD period is determined as the side where the correction value is 0. By determining the polygonal mirror side having the smallest BD period as the side where the correction value is 0, the above-described correction values (xa−xb), (xc−xb) and (xd−xb) can be made positive (values). For example, in the case where the correction value (xc−xb) is a negative value, the generation of the pseudo BD signal for the D side is not in time if the BD signal for the C side has already been sent, and therefore there is a need to generate the pseudo BD signal for the D side by adding a positive correction value to the timing of the BD signal for the B side. However, in the generation of the pseudo BD signal for the D side, when the BD signal for the B side is used as a reference, compared with the case where the BD signal for the C side is used as the reference, the BD signal for the immediately preceding side of the C side. Therefore, the correction value becomes large, so that there is a fear that the accuracy is lowered.

Next, a characteristic feature of this embodiment will be described.

In this embodiment, a constitution in which the yellow image is formed on the basis of the BD signal and then subsequent magenta, cyan and black images are subjected to image registration (alignment) in the main scan direction on the basis of the pseudo BD signal is employed. In such a constitution, this embodiment is characterized in that the yellow image formation is started before completion of the correction value calculation for the pseudo BD signal (before start of output of the pseudo BD signal, i.e., in a period in which the step of deriving the correction value by the second signal output means is executed). Here, the image formation start for each of the colors means start of the electrostatic latent image formation on the photosensitive drum.

By employing such a constitution, it becomes possible to reduce the first print out time in a full-color mode. Here, the yellow image formation corresponds to the image formation on the first image bearing member. Further, before completion of the correction value calculation for the pseudo BD signal refers to before the correction value calculation by the CPU **403** performed by using the value of the BD period calculated by the above-described ASIC **402** is completed.

Parts (A) and (B) of FIG. **6** are timing charts for illustrating the feature of this embodiment, in which (A) of FIG. **6** shows timing in the case where the yellow image formation is started after the completion of the correction value calculation for the pseudo BD signal as in a conventional constitution, and (B) of FIG. **6** shows timing in the case where the yellow image formation is started before the completion of the correction value calculation for the pseudo BD signal as in this embodiment.

The time required for calculating the correction value for the pseudo BD signal is sufficiently shorter than a time between the first image formation timing and the second image formation timing, and therefore the calculation of the correction value for the pseudo BD signal is completed at the timing when the magenta image formation is started. By using the pseudo BD signal obtained by the correction, the magenta image formation is effected. In FIG. **6**, the abscissa represents lapse of time from start of printing, and the ordinate represents processes sequentially performed by the printer. Further, in (A) and (B) of FIG. **6**, the number and required times of respective elements or steps are the same.

First, the processes in (A) of FIG. **6** will be described.

First, a scanner motor and a fixing device are activated (T**100**), and then rise of a high-voltage source (power source) is made (T**101**). The rise of the high-voltage source means that voltages and currents of high-voltage sources four steps of charging, development and transfer necessary for the electrophotographic process are controlled so as to become target values.

When the activation and rise end, calculation of a correction value for the pseudo BD signal is started (T**102**). After the calculation of the correction value for the pseudo BD signal is completed (T**103**), formation and primary transfer of images of four colors of yellow (Y), magenta (M), cyan (C) and black (BK) are started. In this case, the image formation is effected by using the pseudo BD signal **404** generated on the basis of the calculated correction value and the BD signal **401** sent from the BD sensor **110**. Here, in order to generate the pseudo BD signals for magenta, cyan and black even after the yellow image formation is ended, control such that the light is emitted from the laser diode LD**4** only at timing when the BD signal **401** is capable of being outputted (unblanking control). That is, the laser diode LD**4** is caused to emit the light by estimating timing when the light enters the BD sensor **110**.

When this process is ended, secondary transfer for transferring the toner images (developer images) from the intermediary transfer belt **211** onto the recording material is made (T**104**). Thereafter, on the recording material on which the toner images are transferred, the toner images are fixed as a permanent image by the fixing device **313** controlled at a target temperature (T**105**). When the fixing is ended, the recording material is discharged onto the discharge tray (T**106**), and thus the image formation is ended (T**107**).

In the processes in (B) of FIG. **6**, compared with those in (A) of FIG. **6**, yellow image formation start timing is different. The yellow image formation start timing is the timing (T**103**) of the completion of the calculation of the correction value for the pseudo BD signal in (A) of FIG. **6**, whereas the yellow image formation start timing is the same execution timing (T**202**) as the timing of calculation start of the correction value for the pseudo BD signal **404** in (B) of FIG. **6**. This timing (T**202**) is not calculation completion timing (T**203**) of the correction value for the pseudo BD signal. Subsequent control processes (steps) including the image formation, the primary transfer, the secondary transfer, the fixing and the discharge (T**204** to T**207**) in (B) of FIG. **6** are the same as those in (A) of FIG. **6**, and therefore will be omitted from description.

The first print out time is a time from start of printing until the recording material is discharged to the outside of the printer (i.e., a time from reception of print request to the discharge of the recording material to the outside of the printer).

The first print out time in the case where the yellow image formation is started after the calculation of the correction value for the pseudo BD signal is completed is from T**100** to T**107** ((A) of FIG. **6**). On the other hand, the first print out time in the case where the yellow image formation is started before the calculation of the correction value for the pseudo BD signal is completed is from T**200** to T**207** ((B) of FIG. **6**). It is understood that the first print out time (from T**200** to T**207**) in (B) of FIG. **6** is, when compared with the first print out time (from T**100** to T**107**) in (A) of FIG. **6**), shortened by a time (Ts in FIG. **6**) required for calculating the correction value for the pseudo BD signal.

FIG. **7** is a flowchart showing a flow (of a procedure) carried out by the engine controller **204** in this embodiment when the engine controller **204** receives a print instruction (command) from the video controller **203**.

First, the engine controller **204** activates the scanner motor (S**101**). Thereafter, the engine controller **204** discriminates whether or not the number of turns (rotations) of the scanner motor reaches a predetermined number of turns (S**102**). In the following description, a state in which the number of turns of the scanner motor reaches the predetermined number of turns is referred to as scanner ready (state). When the scanner motor is placed in the scanner ready state, the calculation of the correction value for the pseudo BD signal is started and at the same time, the yellow image formation is started (S**103** and S**104**).

In the case where the calculation of the BD period and the calculation of the correction value for the pseudo BD signal are completed until the magenta image formation start timing, the magenta image formation is started (S**105** and S**106**). The pseudo BD signal is outputted immediately after the completion of the correction value calculation. Thereafter, at predetermined image formation start timing, cyan image formation and black image formation are effected, so that a color image is formed (S**108** to S**111**). Here, a state in which the calculation of the BD period and the calculation of the correction value for the pseudo BD signal are completed is referred to as pseudo BD ready (state).

Further, the flow carried out by the engine controller **204** in this embodiment includes a flow ready for the case of abnormal circumstances in which the output of the pseudo BD signal cannot be started due to an improper operation or the like of the ASIC **402**. This case will be described.

In the case where the pseudo BD ready is not realized until magenta image formation start timing, pseudo BD error handling (clearance) is made (S**112**). In the error handling, a result (correction value) when the correction value for the preceding pseudo BD signal is calculated is stored in a storing means, and then the value may be used as the correction value or alternatively a predetermined value of, e.g., 0 may also be used as the correction value for the pseudo BD signal.

This is based on discrimination that although image registration (alignment) accuracy with respect to the main scan direction is inferior to that during the pseudo BD ready due to improper calculation of the correction value for the pseudo BD signal, the image formation is continued based on priority on shortening of the first print out time. At that time, a user may be urged to pay attention by providing notification of warning to a display panel or the host computer.

Incidentally, the discrimination as to whether or not the pseudo BD ready is realized (S**106**) may only be required that the discrimination is made before the cyan image formation in which the latent image is formed on the basis of the pseudo BD signal is started. That is, in the flowchart of FIG. **7**, the procedure may also be modified so that the discrimination as to the pseudo BD ready (S**106**) is made between the magenta image formation start (S**107**) and the cyan image formation start (S**109**). In this embodiment, the reason why the discrimination as to the pseudo BD ready is made between the yellow image formation start (S**104**) and the magenta image formation start (S**107**) is that the ASIC **402** in this embodiment usually has a performance such that the calculation of the correction value for the pseudo BD signal can be completed before the magenta image formation start.

As described above, in this embodiment, in the constitution in which the yellow toner image is formed on the basis of the BD signal and then the toner images of magenta, cyan and black are registered (aligned) with the yellow toner image with respect to the main scan direction on the basis of the pseudo BD signal, the yellow image formation is started before the completion of the calculation of the correction value for the pseudo BD signal and before start of output of the pseudo BD signal. As a result, it becomes possible to shorten the first print out time in an operation in a full-color mode.

Here, in this embodiment, the shortening of the first print out time in the image formation on the recording material was described. However, the constitution in this embodiment is also effective for the purpose of color misregistration correction in the case where the image is formed on the intermediary transfer belt **211**, and thus is not limited to the image formation on the recording material. Further, the example of the polygonal mirror having the four sides was shown. However, the constitution in this embodiment is also effective with respect to polygonal mirrors having three five and more sides, and therefore is not limited to the polygonal mirror having the four sides.

Embodiment 2

Embodiment 2 will be described. In this embodiment, a constitution portion different from that in Embodiment 1 will be described, and a constitution portion similar to that in Embodiment 1 will be omitted from description.

FIG. **8** is a schematic perspective view for illustrating a scanner unit in this embodiment.

In Embodiment 1, the BD sensor **110** was disposed correspondingly to the image formation for the first color in which the light is emitted from the laser diode LD**4**, but this embodiment is characterized in that the BD sensor **110** is disposed correspondingly to image formation for the second color in which the light is emitted from the laser diode LD**3**. The order of the colors during the image formation is the same as in Embodiment 1, and thus the first color is yellow and the second color is magenta.

In the following, a relation between the image formation start and the scanner motor activation in this embodiment will be described. Usually, when the photosensitive drum is exposed to and scanned with laser light during the activation of the scanner motor, an exposed portion is not electrically charged sufficiently in a charging step, so that a charged state of the photosensitive drum is not uniform, and therefore there is a need to wait for a predetermined time in order to form the image on the photosensitive drum.

Therefore, in this embodiment, a constitution in which the photosensitive drum for the second color is exposed to and scanned with the laser light, during the activation of the scanner motor, emitted from the laser diode LD**3**, not the laser diode LD**4** for the first color is employed. As a result, the photosensitive drum for the first color is prevented from being exposed to the laser light during the activation of the scanner motor, and therefore the image formation for the first color can be started in a state in which the photosensitive drum is electrically charged uniformly. Further, also with respect to the photosensitive drum for the second color exposed to the laser light emitted during the scanner motor activation, at the image formation start timing for the second color, a sufficient time in which the photosensitive drum is electrically charged uniformly elapses, and therefore, good image formation can be effected.

The laser diodes LD**4** and LD**3** form the electrostatic latent images by emitting light beams on the basis of the first horizontal synchronizing signal outputted from the BD sensor **110** having received the light from the laser diode LD**3**. The laser diodes LD**2** and LD**1** form the electrostatic latent images by emitting light beams on the basis of the second horizontal synchronizing signal generated on the basis of the first horizontal synchronizing signal and the correction value.

An operation thereof will be described specifically below.

FIG. **9** is a flowchart showing a flow (of a procedure) carried out by the engine controller **204** in this embodiment when the engine controller **204** receives a print instruction (command) from the video controller **203**.

The engine controller **204** activates, when printing is started, the scanner motor (S**201**). Thereafter, the engine controller **204** discriminate whether or not the number of turns (rotations) of the scanner motor reaches a predetermined number of turns (S**202**). After confirming that the scanner motor is placed in the scanner ready state, the calculation of the correction value for the pseudo BD signal and, the yellow image formation are started (S**203** and S**204**).

With respect to the magenta, image formation using the BD signal is made, and therefore image formation is started at the magenta image formation timing (S**205** and S**206**).

In the case where the calculation of the correction value for the pseudo BD signal is completed until the subsequent cyan image formation start timing, control of steps S**207** and S**211** is effected. That is, the correction value for the pseudo BD signal is stored, and at the same time, the cyan image formation is started (S**207** and S**209**). Thereafter, at black image formation start timing, black image formation is effected to form a color image (S**210** and S**211**).

The process in the case where the calculation of the correction value for the pseudo BD signal is not completed is the same as that in Embodiment 1, and therefore will be omitted from description.

As described above, in this embodiment, in the constitution in which the magenta toner image is formed on the basis of the BD signal and then the toner images of yellow, cyan and black are registered (aligned) with the yellow toner image with respect to the main scan direction on the basis of the pseudo BD signal, the yellow image formation is started before the completion of the calculation of the correction value for the pseudo BD signal. As a result, waiting of charging state restoration of the photosensitive drum due to the light emission during the actuation of the motor is avoided, and the image formation of the first color (yellow), so that the first printout time can be shortened.

Embodiment 3

Embodiment 3 will be described. In this embodiment, a constitution portion different from that in Embodiment 1 will be described, and a constitution portion similar to that in Embodiment 1 will be omitted from description.

FIG. **10** is a sectional view showing a general structure of an image forming apparatus in this embodiment.

In Embodiment 1, the case of the single scanner unit was described, whereas in this embodiment, a constitution in which two scanner units are mounted will be described.

In this embodiment, as shown in FIG. **10**, a constitution in which the images of the first and second colors are formed by using a scanner unit **216** and the images of the third and fourth colors are formed busing a scanner unit **215** is employed. In the scanner unit **216**, a light source group for the laser diodes LD**3** and LD**4** and a polygonal mirror **116** are provided. In the scanner unit **215**, a light source group for the laser diodes LD**1** and LD**2** and a polygonal mirror **115** are provided. Further, BD signals are provided correspondingly to image formation of the first and third colors. With respect to the second color, the pseudo BD signal is generated on the basis of output of the BD sensor for the first color, and with respect to the fourth color, the pseudo BD signal is generated on the basis of output of the BD signal for the third color.

FIG. **11** is a block diagram for illustrating a generating method of the pseudo BD signal.

Here, the generation of the pseudo BD signal in the scanner unit **216** will be described. With respect to the generation of the pseudo BD signal in the scanner unit **215**, the generating method is similar to that in the scanner unit **216**.

A BD signal **412** as a horizontal synchronizing signal from a BD sensor **112** is connected with the engine controller **204**. The ASIC **402** receives the BD signal **412** and then calculates a value of a BD period, and thereafter sends the calculated BD signal **412** to the CPU **403**. The CPU **403** calculates, from the value of the BD period, a correction value for generating a pseudo BD signal, and then inputs the correction value into the ASIC **402** through an address data bus. Further, the ASIC **402** generates a pseudo BD signal **416** from the correction value and the BD signal **412** outputted from the BD sensor **112**.

The video controller **203** receives the BD signal **412** outputted from the BD signal **112** and the pseudo BD signal **416** generated by the ASIC **402**. Further, at predetermined timing after the detection of the BD sensor **112**, image data VDOM and VDOY are outputted from the video controller **203** to the laser diodes LD**3** and LD**4** of the scanner unit **216**.

By employing such a constitution, even in a constitution in which a plurality of scanner units are provided, similarly as in Embodiment 1, by starting the image formation before the completion of the calculation of the correction value for the pseudo BD signal, it is possible to shorten the first print out time while ensuring accuracy of image registration (alignment).

The above operation will be described specifically below.

FIG. **12** is a flowchart showing a flow (of a procedure) carried out by the engine controller **204** in this embodiment. The scanner units **215** and **216** are independently operated, and therefore a difference from Embodiment 1 is that the image formation is effected after confirming the scanner ready (state) and the pseudo BD ready (state) with respect to each scanner unit. The flow will be described specifically below.

The engine controller **204** activates, when printing is started, an unshown scanner motor mounted in each of the scanner units **215** and **216** (S**301**). First, the engine controller **204** discriminates whether or not the number of turns (rotations) of the scanner motor for the scanner unit **216** reaches a predetermined number of turns (S**302**). When the scanner motor for the scanner unit is **216** is placed in the scanner ready state, the calculation of the correction value for the pseudo BD signal **416** is started and at the same time, the yellow image formation is started (S**303** and S**304**).

In the case where the calculation of the correction value for the pseudo BD signal **416** is completed until the magenta image formation start timing, the magenta image formation is started (S**305** to S**307**). On the other hand, in the case where the engine controller **204** discriminates that the scanner unit **216** is not in the pseudo BD ready state, pseudo BD error handling (clearance) is made (S**315**). The pseudo BD error handling is the same as that in Embodiment 1, and therefore will be omitted from description.

Then, at timing when the scanner unit **215** is in the scanner ready state, the calculation of the correction value for a pseudo BD signal **415** is started, and at the same time, the cyan image formation is started (S**308** to S**311**). In the case where the scanner unit **215** is not in the scanner ready state, scanner motor activation abnormality handling (clearance) is effected (S**308** and S**316**). In the scanner motor activation abnormality handling, the image forming position is stopped immediately, and then a message to the effect that the scanner motor is out of order is displayed on the display panel provided on the printer or is notified to the host computer connected with the printer.

Next, in the case where the calculation of the correction value for the pseudo BD signal **415** is completed until the black image formation start timing, the black image formation is started (S**312** to S**314**).

By the above processes, the color image is formed.

As described above, in this embodiment, in the constitution in which the two scanner units are provided and with respect to each scanner unit, image registration (alignment) with respect to the main scan direction is carried out by using the BD signal and the pseudo BD signal, the yellow image formation is started every scanner unit before the completion of the calculation of the correction value for the pseudo BD signal. As a result, it becomes possible to shorten the first print out time.

While the invention has been described with reference to the structures disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purpose of the improvements or the scope of the following claims.

This application claims priority from Japanese Patent Applications Nos. 272832/2012 filed Dec. 13, 2012 and 251891/2013 filed Dec. 5, 2013, which are hereby incorporated by reference.

What is claimed is:

1. An image forming apparatus for starting image formation on the basis of a print command, comprising:

first and second light sources each for emitting light according to image data;

a rotatable polygonal mirror including a plurality of reflecting facets, wherein said rotatable polygonal mirror deflects the light emitted from said first light source toward a first photosensitive member and deflects the light emitted from said second light source toward a second photosensitive member;

a first signal output unit for outputting a first signal by receiving, in a predetermined position, the light emitted from said first light source and deflected by said rotatable polygonal mirror; and

a second signal output unit for outputting a second signal at timing on the basis of the first signal and a correction value, wherein the correction value is set for each reflecting facet of said rotatable polygonal mirror,

wherein said first light source emits the light according to the image data based on a time when the first signal is outputted and said second light source emits the light according to the image data based on a time when the second signal is outputted so that latent images are formed on the first and second photosensitive members, respectively,

wherein said second signal output unit starts the output of the second signal after a lapse of a predetermined period from start of the output of the first signal by said first signal output unit after said image forming apparatus receives the print command, and

wherein after said image forming apparatus receives the print command and before the output of the second signal is started, said first light source starts light emission according to the image data.

2. An image forming apparatus according to claim **1**, wherein the light emitted from said first light source and the light emitted from said second light source at the same timing are incident on different reflecting facets of said rotational polygonal mirror to illuminate the first and second photosensitive members therewith, respectively.

3. An image forming apparatus according to claim **1**, further comprising:

a belt contactable to the first and second photosensitive members,

wherein with respect to a movement direction of a surface of said belt, a contact portion between the first photosensitive member and said belt is provided upstream of a contact portion between the second photosensitive member and said belt.

4. An image forming apparatus according to claim **3**, wherein the latent images formed on the first and second photosensitive members, respectively, are developed with developers to form developer images, and

wherein the developer images are superposedly transferred from said first and second photosensitive members onto said belt.

5. An image forming apparatus according to claim **3**, wherein the latent images formed on the first and second photosensitive members, respectively, are developed with developers to form developer images, and

wherein the developer images are superposedly transferred from the first and second photosensitive members onto a recording material conveyed on said belt.

6. An image forming apparatus according to claim **1**, wherein in the predetermined period, said second signal output unit derives the correction value, for correcting the first signal for each reflecting facet of said rotational polygonal mirror, and then generates and outputs the second signal for each reflecting facet of said rotational polygonal mirror on the basis of the correction value and the first signal, and

wherein in a period in which a step of deriving the correction value by said second signal output unit is executed, said first light source starts light emission on the basis of the first signal to form the latent image on the first photosensitive member.

7. An image forming apparatus according to claim **6**, wherein the step of deriving the correction value by said second signal output unit includes a step of deriving the correction value on the basis of an interval between adjacent first signals outputted for each reflecting facet of said rotatable polygonal mirror.

8. An image forming apparatus according to claim **1**, wherein the latent image formed on the first photosensitive member is developed with a yellow developer.

9. An image forming apparatus according to claim **1**, wherein the latent image formed on the first photosensitive member is developed with a magenta developer.

10. An image forming apparatus according to claim **1**, wherein the first signal is outputted for each reflecting facet of said rotatable polygonal mirror by said first signal output unit, and the second signal is outputted for each reflecting facet of said rotatable polygonal mirror by said second signal output unit.

11. An image forming apparatus according to claim **1**, wherein a latent image formation position is determined, with respect to a main scan direction, when the latent image is formed on the first photosensitive member by the light emission of said first light source after a lapse of the predetermined period from the output of the first signal, and is determined, with respect to the main scan direction, when the latent image is formed on the second photosensitive member by the light emission of said second light source after a lapse of a predetermined period from the output of the second signal.

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